



5.4.12 Tropical Storms / Hurricane

History

A total of 13 tropical cyclones in Arizona were identified, four of which resulted in a disaster/emergency declaration. Over 30 fatalities were recorded, 975 injuries, and over \$750 million in damages, most of which were due to flooding associated with the tropical cyclones*. These events include the following:

- September 1970, the remains of tropical storm Norma brought severe flooding to Arizona and became the deadliest storm in Arizona history, leading to a Presidential disaster declaration. There were 23 fatalities in central Arizona, including 14 from flash flooding in Tonto Creek in the vicinity of Kohl's ranch. The total rainfall at Workman Creek about 30 miles north of Globe in the Sierra Ancha mountains was 11.92 inches, with 11.40 inches in 24 hours. This remained the 24 hour rainfall record for Arizona until 1997. Other rainfall amounts included 9.09 at Upper Parker Creek, 8.74 inches at Mount Lemmon, 8.44 inches at Sunflower, 8.08 at Kitt Peak, 7.12 at the Tonto Creek fish hatchery, and 7.01 inches at Crown King (ADEM, December 2001).
- September 1976, the remains of Hurricane Kathleen moved across Baja and into southern California near El Centro. With its circulation still intact a tropical storm force winds produced considerable damage in Yuma. Sustained winds exceeded 50 mph and gusts as high as 76 mph. One man was killed when a 75-foot palm tree crashed into his mobile home. Severe flooding occurs in Mohave County and across southern California. Residual moisture brought more severe thunderstorms to the State on September 24 and 25. The Tucson area was particularly hard hit with flash flooding and hail as large as golf balls. Hail covered the ground to a depth of 5 inches on Mount Lemon (ADEM, December 2001).
- September 1983, Arizona was struck by a particularly strong tropical low. Flooding killed eight persons, reportedly injured 975, and caused \$226.5 million in damages in the State. (FEMA, January 1991).
- September 1997, Tropical Storm Nora reached the level of a category four hurricane before making landfall in California. Nora caused enormous flooding and \$375 million in damages in Arizona, leading to a Presidential disaster declaration. The calculated 24-hour, 100-year rainfall amount in NW Maricopa County was exceeded at six Automated Local Evaluation in Real Time (ALERT) measuring sites. Yuma observed a 2-minute sustained wind of 45 mph during Nora's passage, a rarity in the United States for eastern Pacific tropical cyclones. Peak gusts of 54 mph, and 52 mph were also observed (ADEM, December 2001; NCDC, Storm Event Database; Maricopa County Flood Control District, September 2003; NWS).

*Reported fatalities, injuries and damages are difficult to assess as records from flooding caused by tropical storms were considered in these numbers. Our records of declarations are also difficult to use for the same reason. In several cases flooding is used as the nature of the declaration and one must research the event to determine its cause. Even then, depending on the researcher, the information may be subjective. Therefore, these numbers should be considered estimates and all relating in some way to tropical storms.

Probability and Magnitude

Tropical cyclone probability is generally derived from coastal flooding caused by storm surge or by the frequency of tropical cyclones is determined by the number of landfall events over a given period of time for specific geographic areas. Since Arizona is not a coastal state and, in comparison with most coastal states, it has experienced few tropical cyclones, the probability and magnitude of tropical cyclone events has not been estimated for Arizona. However, as indicated by the historic data above, Arizona was affected by eight identified tropical cyclone events during the years 1962-2006, several of which caused massive damage, primarily via flooding. This suggests a low probability, but potentially high magnitude for tropical cyclones in Arizona.

Vulnerability

For the purposes of this planning effort, the flooding/flash flooding and tropical storms/hurricane both result in flooding, and are therefore considered together as one category. For information regarding the vulnerability assessment refer to "Flooding/Flash Flooding".

Sources:

National Weather Service, April 2003. Storm Data and Unusual Weather Phenomena – Maricopa County.